(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 974 807 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.01.2000 Bulletin 2000/04

(51) Int Cl.[7]: **F41J 3/00**

(21) Application number: **99305827.0**

(22) Date of filing: **22.07.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.07.1998 US 120677**

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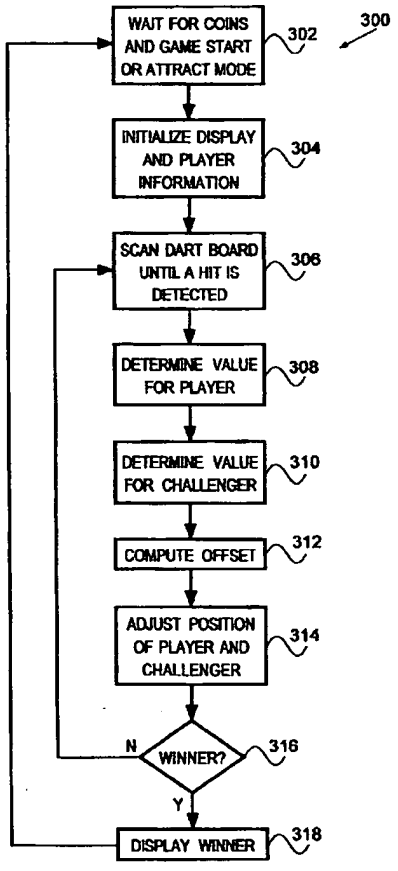
(54) Computer controlled dart game and method of controlling such a game

(57) The present invention provides an apparatus for playing and method of controlling a computerized dart game of simulated tug-of-war. The method generates on a display a goal graphic, at least one player graphic, and at least one challenger graphic. The goal graphic typically includes a first side on which the player graphic is initially displayed and a second side on which the challenger graphic is initially displayed. The method monitors the segments in at least one electronic dart board for hits by darts and determines at least one offset value associated with a segment hit by a dart. The offset value may represent the sum of one or more hits by a player, the sum of one or more hits by a challenger, of the difference between one or more by a player and hits by a challenger. In a single player game, the method itself may generate a random challenger value. The method further adjusts, on the display, the position of the player graphic in relation to the first side of the goal and adjusts the position of the challenger graphic in relation to the second side of the goal. The amount of adjustment is based on the offset value. When the challenger graphic is adjusted to cross the second side of the goal graphic, the method declares the player a winner and when the player graphic is adjusted to cross the first side of the goal graphic, the method declares the challenger a winner. Preferably, the method monitors two (or more) independent electronic dart boards. Each dart board may be connected to and controlled by a single controller. The single controller may then scan each dart board in turn to determine the segments hit by darts for the player and the challenger.

FIG. 3



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Description

[0001] The present invention relates to computer controlled games. In particular, the present invention relates to a computer dart game and methods of controlling such games which allow players to engage in a simulated tug-of-war contest.

[0002] The ancient game of darts has long been a mainstay of bars, restaurants, and even homes. Many versions and variants of darts exist, including, for example, Cricket and Random Cricket. Only recently, however, have inventors applied modern electronics and computer technology to the game of darts and thereby allowed entirely new developments in and variations of dart based games.

[0003] Electronic dart games and associated electronics are disclosed, for example, in U.S. Pat. Nos. 5,401,033 to Lychock, Jr., 4,057,251 to Jones et al., 4,561,660 to Zammuto, and 4,586,716 to Brejcha et al. The Lychock, Jones, Zammuto, and Brejcha patents are incorporated herein by reference in their entireties. The Lychock patent, for instance, discloses an electronic dart game with a random target number generator that may be used to play a random Cricket game. The Lychock dart game randomly generates target values for display on an electronic dart board, and fixes for future reference only those values marked by a dart hit during a player's turn. Because the target values change while the game is being played, more interesting, challenging, and exciting play results.

[0004] Recent developments in computerized dart games have also provided a video display associated the dart game. The video display may show the current scores, advertisements, diagnostic information, and the like. Such an electronic dart game is disclosed in U.S. Pat. No. 4,824,121 to Beall et al. The Beall patent is incorporated herein by reference in its entirety.

[0005] Furthermore, entirely new possibilities for multiple player competitive or cooperative play have been provided by the Multiple Target Electronic Dart Game disclosed by Martin in U.S. Pat. No. 5,020,806. In the Martin patent, two independent electronic dart boards operate under the supervision of a single microcontroller. A display also operates under control of the microcontroller and may show player scores in a split screen display (for independently played games) or in a single display (for multi-player competitive or cooperative games).

[0006] The present invention is directed at a computerized tug-of-war dart game. The game may be single- or multi-player, and can provide engaging graphics associated with the game. It can also use multiple independent electronic dart boards.

[0007] According to one aspect of the invention there is provided an apparatus for playing and a method of controlling a computerized dart game of simulated tug-of-war. The method generates on a display a goal graphic, at least one player graphic, and at least one challenger graphic. The goal graphic typically includes a first side on which the player graphic is initially displayed and a second side on which the challenger graphic is initially displayed. The player graphic may correspond to player 1, while the challenger graphic may correspond to player 2, for example.

[0008] The method monitors the segments in at least one electronic dart board for hits by darts and determines at least one offset value associated with a segment hit by a dart. The offset value may represent the sum of one or more player values, the sum of one or more challenger values, or the difference between one or more player or challenger values. In a single player game, the method itself may generate a random challenger value. The offset value calculation is not limited to sums and differences, but may be determined by any function.

[0009] The method can further adjust, on the display, the position of the player graphic in relation to the first side of the goal, and the position of the challenger graphic in relation to the second side of the goal. The amount of adjustment is based on the offset value. When the challenger graphic is adjusted to cross the second side of the goal graphic, the method declares the player a winner and when the player graphic is adjusted to cross the first side of the goal graphic, the method declares the challenger a winner.

[0010] As noted above, the invention can use two (or more) independent electronic dart boards. Each dart board may be connected to and controlled by a single controller. The single controller may then scan each dart board in turn to determine the segments hit by darts thrown by the player and the challenger.

[0011] The invention will now be described by way of example and with reference to the accompanying drawings, wherein:

[0012] Figure 1 illustrates one embodiment of a multiple target dart game which may be used to play a simulated tug-of-war game.

[0013] Figure 2 shows a simplified block diagram of the hardware components associated with the multiple target dart game of Figure 1.

[0014] Figure 3 illustrates one example of the processing flow associated with a computerized tug-of-war dart game.

[0015] Turning now to Figure 1, one embodiment of a computerized dart game 100 is illustrated. The dart game 100 includes a player interface 102, a first electronic dart board 104, and a second electronic dart board 106. The dart game 100 also includes a display 108 and several interface keys 110.

[0016] The player interface 102 includes, for example, coin slots with associated coin mechanisms, coin return slots, dollar bill acceptors and the like. Additionally, game selection controls, one (or more) player start buttons or other inputs may be provided on the player interface 102. Alternatively, one or more of the inputs may be implemented with the interface keys 110.

[0017] It is noted that the interface keys 110 and player interface 102 are not necessarily the only sources of player input. For example, a touchscreen (not shown) may be provided on the display 108 and controlled by a processor in the dart game 100. The display 108 itself may then present the user with various game selection choices which may be activated by pressing the appropriate location on the touchscreen.

[0018] The display 108 may vary widely in implementation. For example, the display 108 may be a Cathode Ray Tube (CRT) based display, a Liquid Crystal Display (LCD), or even a dense grid of Light Emitting Diodes (LEDS). The characteristics of the display 108 may vary as well. For example, the display may be color or monochrome, or may vary in size from a 9 inch or smaller display to a 21 inch or larger display. The dart game 100 may also provide video output connectors that provide standard connections to VGA, NTSC, or S-Video displays. The display may then be mounted in a location remote from the dart game 100 itself.

[0019] The dart game 100 includes a first electronic dart board 104. Optionally additional electronic dart boards (for example, the second electronic dart board 106) may be connected to a processor in the dart game 100 to provide nearly simultaneous play. Suitable electronic dart boards 104 may be obtained from Arachnid, Inc. of Rockford, Illinois and may be implemented, for example, as described in U.S. Pat. No. 4,057,251.

[0020] The electronic dart board 104 may include, for example, a set of switches (which may be magnetic, mechanical, or optical) associated with each segment (including double mark, triple mark, and bullseyes) for each target value on the dart board 104. When a dart hits a segment, one of the switches associated with the segment closes. By scanning the set of switches with a general purpose bus, a processor determines which switch has closed and may therefore determine the associated segment and target value.

[0021] Turning now to Figure 2, one example of the hardware configuration 200 of the dart game 100 is shown. The hardware configuration 200 includes the display 108, the first electronic dart board 104, and the second electronic dart board 106. A central processor 202 connects to the first and second electronic dart boards 104 and 106 and the display 108. A memory 204 provides the processor 202 with memory resources and may include banks of RAM, ROM, flash memory, EEPROM, or magnetic memory.

[0022] The processor 202 may be implemented with a single processor unit, for example, a processor available from Motorola, Texas Instruments, or Intel. Alternatively, the processor 202 may be implemented with discrete logic, programmable logic, or a combination of a high level processor core and discrete logic. In operation, the processor 202 generally operates according to the software flow shown in Figure 3.

[0023] Turning now to Figure 3, a flowchart 300 illustrates one of many possible implementations of a program for a computerized tug-of-war dart game. The processor 202 executes instructions stored in the memory 204 which correspond to the steps illustrated in Figure 3. The steps shown in Figure 3 generally correspond to a two player game of computerized tug-of-war darts. Modifications to the steps in Figure 3 will be explained below and cover, for example, one player play and attract mode operation.

[0024] Starting with step 302, the instructions generally wait for one or more players to insert money into the dart game 100 and press the start button for one player or two players. Alternatively, the instructions may start an attract mode periodically which illustrates the features of the game and how it is played. Next, at step 304, the instructions clear the display, player scoring totals, and the like.

[0025] The instructions at step 304 further generate graphics on the display 108 including a player graphic, a challenger graphic, and a goal graphic. As noted above, the player graphic is typically associated with player 1, or the first player to throw darts. The challenger graphic is typically associated with player 2. The player and challenger graphics may be drawn as a series of individuals holding a rope, for example. Of course, alternate graphics including, for example, robots, dragons, and dinosaurs, may be provided and may be selected by each player using the interface keys 110.

[0026] The instructions for step 304 also generate the goal graphic, which typically includes a first side on which the player graphics are initially placed and a second side on which the challenger graphics are initially placed. As an example, the goal graphic may be a mud pit, with one side of the pit closest to the player graphics and a second side of the pit closest to the challenger graphics. Other goal graphics are also suitable, and may be chosen by players using the interface keys 110.

[0027] Next, operation moves to step 306, in which the instructions cause the processor 202 to scan the dart board 104 for dart hits. In a dart game 100 with a single dart board 104, the processor may assume, for example, that the players alternate and therefore alternate dart hits are to be assigned in an alternating fashion to the player and the challenger. The dart game 100 may make use of a "skip turn" interface key 110 to provide for the situation in which the player or challenger misses the dart board 104 altogether. The processor may alternatively assume, for example, that sets of three, two darts for the player and three for the challenger, or any other dart throwing schedule may be used by the player and challenger. The dart throwing schedule may be selected using the interface keys 110 before the game starts.

[0028] If running in an attract mode, the instructions for step 306 may chose the dart segments hit by the player and challenger in a random fashion. It is also noted that in attract mode, the dart game 100 does not have to finish each example game completely. Rather, the attract mode may terminate at any point, in particular,

when money has been inserted into the dart game 100.

[0029] If multiple electronic dart boards are used, the instructions for step 306 may scan the first dart board 104 for hits by the player and separately scan the second dart board 106 for hits by the challenger. The instructions may assume any dart throwing schedule, or may assume a lack of a schedule altogether. For example, the player and the challenger may throw darts as quickly as possible at their respective targets without limitations on taking turns.

[0030] As noted above, the switches associated with each segment on the dart board 104 allow the processor 202 to determine which segment has been hit. The instructions at steps 308 and 310 assign a player value and a challenger value associated with the particular segment that was hit. Thus, the values may correspond to the standard 1-20 plus bullseye values, including double and triple scores or may correspond to an arbitrary assignment or randomly assigned set of values to segments.

[0031] At step 312, instructions compute an offset based on the player value and the challenger value. The offset determines how far to move the player graphics and the challenger graphics toward or away from their respective sides of the goal graphic. As an example, assume that the player value is 15 and the challenger value is 20. A combined offset may be calculated as (15 - 20 = -5 * scale), where "scale" coverts the difference between the player value and challenger value to a pixel count. A positive pixel count may then adjust the challenger toward the second side of the goal (and correspondingly the player graphic away from the first side of the goal). A negative pixel count may adjust the challenger away from the second side of the goal (and correspondingly the player graphic toward the first side of the goal).

[0032] Many modifications on the instructions associated with step 312 are possible. For example, difficulty levels may be implemented which factor down, or otherwise reduce a player's value or challenger's value. In another embodiment, particularly one using multiple dart boards 104 and 106, individual offsets may be determined separately for the player and the challenger based on their respective values as each player's dart hits the first dart board 104 and as each challenger's dart hits the second dart board 106. Furthermore, in a one player game, the challenger value may be determined in step 310 randomly and influenced by game parameters such as difficulty level.

[0033] Next, in step 314, the position of the player graphics and the challenger graphics are adjusted according to individual or combined offsets as computed in step 312. As an example, the instructions may interpret a positive offset to adjust the player graphic away from the first side of the goal and interpret a negative offset to adjust the challenger graphic away from the second side of the goal. It is noted that the processor 202 generally stores the current position of the player graphic and the challenger graphic in the memory 204.

[0034] At step 316, instructions determine whether there is a winner based in part on the current positions of the player and challenger graphics. If not, processing returns to step 306, and is so, processing continues to step 318. Determining a winner may be done in many ways. For example, the winner may be the player when the last portion of the challenger graphic has crossed the second side of the goal graphic (and thus, the challenger has been pulled into the mud pit).

[0035] In one embodiment, the player or challenger graphics may include more than one individual (for example, five persons on each side by default and further configurable with the interface keys 110). Then, for example, as the challenger graphic crosses the second side of the goal graphic, one of the individuals may be shown falling into the goal graphic (i.e., the mud pit). The individual in the mud pit may then be removed from the challenger graphic to reflect the number of individuals remaining (i.e., the number of individuals that have not fallen into the mud pit). A corresponding decrease in the offset calculated for the challenger may follow in calculation step 312. Thus, for example, the offset may be calculated as (individuals_remaining * challenger_value * challenger_scale). When no individuals remain on the challengers side, for example, step 316 may then determine that the player is the winner.

[0036] Note that many parameters values may be adjusted before or during the game to set appropriate difficulty levels. Thus, for example, "scale" may be increased to adjust the player or challenger graphics greater distances on each dart hit independently for the player and the challenger. Furthermore, the influence on the offsets associated with pulling individuals across the sides of the goal graphic may be increased, reduced, or eliminated.

[0037] It is further noted that the Tug-of-War dart game disclosed above need not use complicated graphics. As an example, in an alternative embodiment, the display 108 may show a present value which changes as darts hit the target. Thus, for example, the present value may start at 50, with a player goal set (e.g., randomly or in a predetermined manner as influenced by difficulty settings and the like) at 100 and a challenger goal set at 0. The processor 202 may then translate subsequent dart hits by the player into a player value and offset (that is this embodiment is not related to motion of graphics and a pixel count) that is added to the present value. As above, the offset may be determined by many different functions and adjusted according to difficulty level and the like or may simply be set through an identity function to the player value. Similarly, when the processor 202 may translate subsequent dart hits by the challenger into a challenger value and offset that is subtracted from the present value.

[0038] Alternatively, a player number may be displayed for the player and a challenger number may be displayed for the challenger. The player number and

challenger number may be increased or decreased according to darts hits and corresponding player and challenger values until a common goal or one of two independent goals is reached. Again, play may proceed in turns with the offset calculated after each player has thrown, or as each player throws, or multiple dart targets may be used to provide simultaneous play.

Claims

1. A dart game for playing a simulated tug-of-war game wherein darts are thrown at segments in dart boards to adjust player and challenger graphics toward or away from a goal graphic, the dart game comprising:

   a first electronic dart board comprising a plurality of segments;
   a controller connected to the first electronic dart board;
   a display connected to the controller;

   a memory connected to the controller, the memory comprising:

   instructions that generate a player graphic, a challenger graphic, and a goal graphic on the display;
   instructions that cause the controller to scan segments for hits by darts;
   instructions that determine at least one offset value associated with at least one segment hit by a dart; and
   instructions that adjust on the display, based on the at least one offset value, the position of the player graphic in relation to the goal, and that adjust the position of the challenger graphic in relation to the goal.

2. A dart game according to Claim 1, wherein the memory further comprises instructions that determine during a player's turn, a player value associated with a segment hit by a dart; and instructions that randomly determine, during a challenger's turn, a challenger value; and instructions that determine the offset value as a function of the player value and the challenger value.

3. A dart game according to Claim 1, wherein the memory further comprises:

   instructions that determine, during a player's turn, a player value associated with a segment hit by a dart;
   instructions that determine, during a challenger's turn, a challenger value associated with a segment hit by a dart; and
   instructions that determine the offset value as a function of the player value and the challenger value.

4. A dart game according to any preceding claim, wherein the memory further comprises instructions that declare the player a winner when the position of the challenger graphic on the display crosses the goal graphic.

5. A dart game according to Claim 4, wherein the memory further comprises instructions that declare the challenger a winner when the position of the player graphic on the display crosses the goal graphic.

6. A dart game according to any preceding claim, further comprising a second electronic dart board comprising a plurality of segments, and wherein the second electronic dart board is connected to the controller.

7. A method of controlling a computerized dart game, the method comprising the steps of:

   generating on a display a goal graphic;
   generating on a display at least one player graphic and positioning the player graphic on a first side of the goal graphic;
   generating on the display at least one challenger graphic and positioning the challenger graphic on a second side of the goal graphic;
   monitoring segments in at least one electronic dart board for hits by darts;
   determining at least one offset value associated with at least one segment hit by a dart in the electronic dart board;
   adjusting on the display the position of the player graphic in relation to the first side of the goal and adjusting the position of the challenger graphic in relation to the second side of the goal based on the at least one offset value.

8. A method according to Claim 7 further comprising the step of declaring the player a winner when the adjusting step adjusts the position of the challenger graphic on the display to cross the second side of the goal graphic.

9. A method according to Claim 8 further comprising the step of declaring the challenger a winner when the adjusting step adjusts the position of the player graphic on the display to cross the first side of the goal graphic.

10. A method of controlling a computerized dart game, the method comprising the steps of:

generating a present value and displaying the present value on a display;
determining a player goal;
determining a challenger goal;
monitoring segments in at least one electronic dart board for hits by darts;
determining at least one offset value associated with at least one segment hit by a dart in the electronic dart board;
adjusting the present value based on the at least one offset value.

11. The method according to Claim 10 further comprising the step of declaring the player a winner when the adjusting step adjusts the present value to reach the player goal.

12. The method according to Claim 10 further comprising the step of declaring the challenger a winner when the adjusting step adjusts the present value to reach the challenger goal.

13. A method according to any of Claims 7 to 12 wherein the step of determining determines, during a player's turn, a player value associated with a segment hit by a dart, and further comprising the step of randomly determining, during a challenger's turn, a challenger value, and wherein the determining step determines the offset value as a function of the player value and the challenger value.

14. A method according to any of Claims 7 to 12 wherein the step of determining determines, during a player's turn, a player value associated with a segment hit by a dart and determines, during a challenger's turn, a challenger value associated with a segment hit by a dart, and wherein the determining step determines the offset value as a function of the player value and the challenger value.

15. A method of controlling a computerized dart game, the method comprising the steps of: generating a player number and a challenger number and displaying the player number and a challenger number on a display;

determining a player goal;
determining a challenger goal;
monitoring segments in at least one electronic dart board for hits by darts;
determining at least one offset value associated with at least one segment hit by a dart in the electronic dart board;
adjusting on the display of the player number and the challenger number based on the at least one offset value.

16. The method of Claim 15 wherein the step of determining determines, during a player's turn, a player value and a player offset associated with a segment hit by a dart, and further comprising the step of randomly determining, during a challenger's turn, a challenger value and a challenger offset.

17. A method according to Claim 15 or Claim 16 wherein the step of determining determines, during a player's turn, a player value and a player offset associated with a segment hit by a dart and determines, during a challenger's turn, a challenger value and a challenger offset associated with a segment hit by a dart.

18. A method of any of Claims 15 to 17 further comprising the step of declaring the player a winner when the adjusting step adjusts the player number to reach the player goal.

19. A method according to Claim 18, further comprising the step of declaring the challenger a winner when the adjusting step adjusts the challenger number to reach the challenger goal.

20. The method of any of Claims 6 to 19 wherein the monitoring step monitors two independent electronic dart boards.

FIG. 1

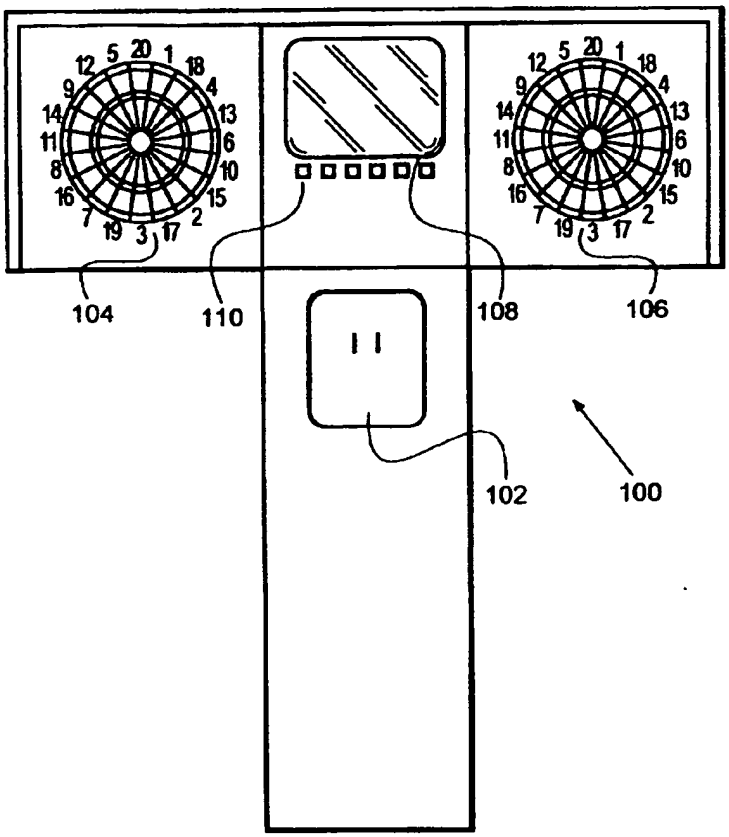

104
110
108
106
102
100

FIG. 2

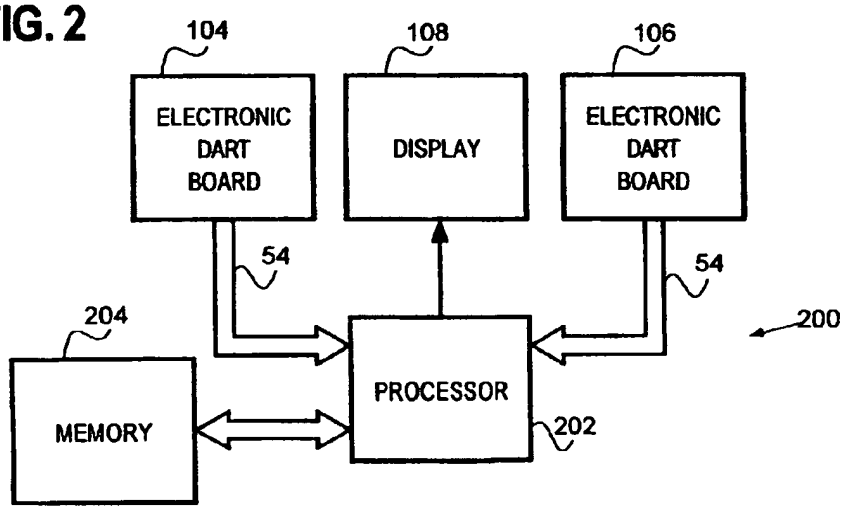
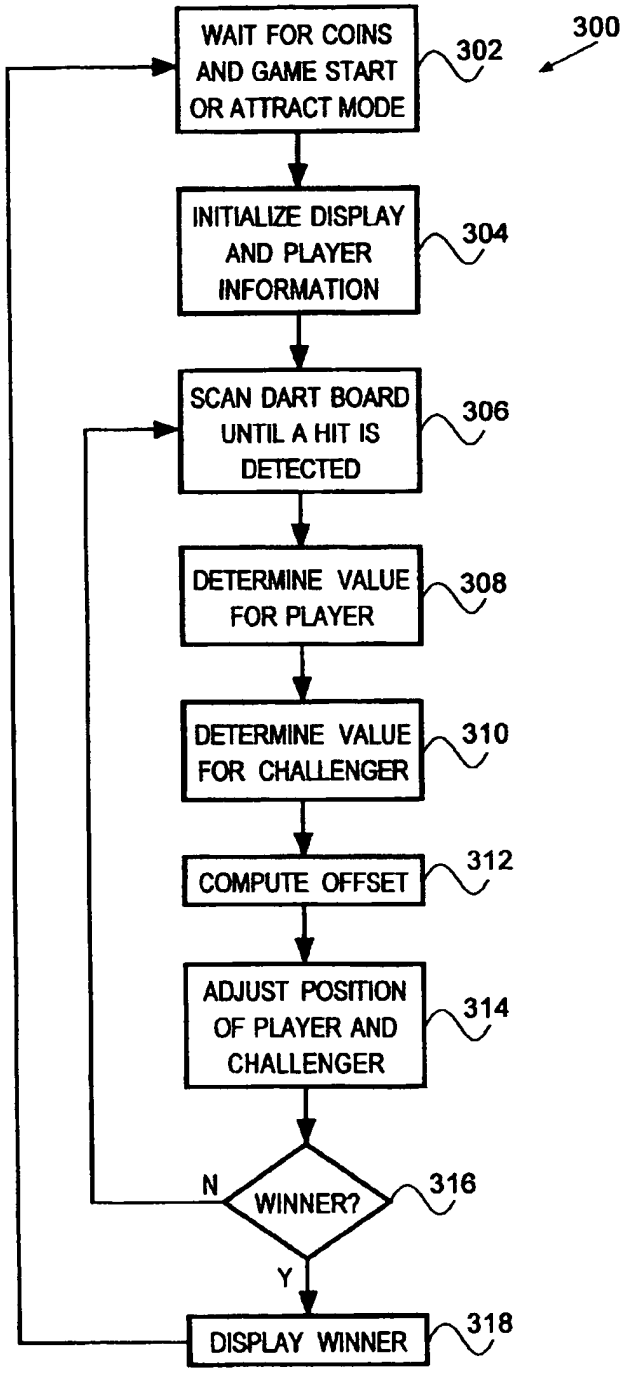

104
108
106
ELECTRONIC DART BOARD
DISPLAY
ELECTRONIC DART BOARD
54
54
200
204
PROCESSOR
MEMORY
202

FIG. 3


300
WAIT FOR COINS AND GAME START OR ATTRACT MODE
302
INITIALIZE DISPLAY AND PLAYER INFORMATION
304
SCAN DART BOARD UNTIL A HIT IS DETECTED
306
DETERMINE VALUE FOR PLAYER
308
DETERMINE VALUE FOR CHALLENGER
310
COMPUTE OFFSET
312
ADJUST POSITION OF PLAYER AND CHALLENGER
314
WINNER?
316
N
Y
DISPLAY WINNER
318